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| EXAMINER | |
|---|---|
| KUMAR, PANKAJ | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2631 | |

DATE MAILED: 09/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/919,191 | ONGGOSANUSI ET AL. | |
| | Examiner | Art Unit | |
| | Pankaj Kumar | 2631 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *27 June 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,6-9,16,19,22-26,33,34 and 37* is/are rejected.

7)☒ Claim(s) *4,5,10-15,17,18,20,21,27-32,35 and 36* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Response to Arguments*

1. Applicant's arguments filed have been fully considered but they are not persuasive.

2. Applicant's representative wanted a call if issue is unresolved. Mr. Rountree was called on 9/13/2005 and was told that the mappings are different in Robertson and new reference Ko has different mappers.

3. Applicant argues that the Robertson reference does not teach that the second coded bits to signal mapping differs from the first coded bits to signal mapping since the bits-to-signal mapping does not change with different input signals. This is not persuasive since as is clearly shown in fig. 2 of Robertson, the output of the top mapper is different than the output of the bottom mapper since the inputs to the mappers are different. Thus, although the mappers are both doing 8PSK, the applicant's have claimed mapping to be different and fig. 2 of Robertson clearly shows mapping is different as there is a different output if the input changes.

4. Also, when considering that in bottom part of figure 2 of Robertson that the combination of the deinterleaver with the 8PSK mapper makes this different than the top 8PSK mapper without any deinterleaver or any other element before the output. As is shown in Robertson's figure 2 with the arrows indicating mapping, as the interleaver is mapping even positions to even positions and odd positions to odd positions, the deinterleaver would map analogously.

5. Also, to change from one type of mapping to another type of mapping is a matter of design choice. Lacking any criticality, changing the size or range of the prior art parts does not make the claimed invention patentable over that prior art (In re Rose, 105 USPQ 237). Thus, as the broadly worded claims do not specify the mapper, changing from, for example, an 8PSK

mapper to a 16PSK mapper does not make a claimed invention patentable. Similarly, lacking any criticality, changing the proportion of prior art parts does not make the claimed invention patentable over that prior art (In re Reese, 129 USPQ 402). Also, lacking any criticality, changing the form or shape of prior art parts does not make the claimed invention patentable over that prior art (In re Dailey, 149 USPQ 47). Also, to change the aesthetic or ornamental design of prior art parts does not make the claimed invention patentable over that prior art (In re Seid, 73 USPQ 431).

6. In response to applicant's argument (regarding the combination or Robertson with Wei) that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

7. Applicant argues that the modification of Robertson does not have a reasonable expectation of success since Robertson teaches the same two mappers while the applicant's have different mappers. This is not persuasive. First, applicant's have claimed different mappings and not different mappers. Second, the choice of the type of mapper is a matter of design choice. Just as the applicant was successful with two different mappers, Robertson is also successful with its choice of different mappers. Third, the reference below, Ko, is successful with different choice of mappers.

8. Applicant argues that Robertson teaches away from having different mappers. This is not persuasive since what is claimed is that the mappings differ and not that the mappers are different. Secondly, figure 1 of Robertson broadly shows two signal mappers without indicating whether or not they are the same. Also, figure 2 of Robertson shows two 8PSK mappers, these are merely examples and Robertson has not specifically put a restriction on the type of mappers. For example, Robertson puts a restriction on the interleaver on page 208 lines 7-8 with the interleaver being restricted etc. No such language exists for the two separate signal mappers of figure 1.

9. A prima facie case of obviousness is established when the teachings of the prior art would appear to have suggested the claimed subject matter to a person of ordinary skill in the art. The combined teachings of the prior art need not provide an absolute prediction of success for the claimed subject matter. Instead, only a reasonable likelihood of success is required (In re Ball Corporation, 18 USPQ 2d 1491).

10. Applicant argues that examiner's statement that Robertson suggests to compare different mapping schemes to see which one has a better BER is ipse dixit. This is moot in view of new ground of rejection.

***Response to Amendment***

***Claim Rejections - 35 USC § 103***

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. Claims 16, 19, 22, 23, 34, 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Robertson IEEE Feb. 1998 vol. 16 no. 2 pages 206-218 in view of Ko USPN 5,703,580.

13. As per claim 16: A parallel concatenated trellis-coded modulation apparatus, comprising: an input for receiving uncoded bits from a communication application (Robertson fig. 1: third and fourth inputs of top signal mapper); a first coder (Robertson fig. 1: top encoder including adders, delays, etc.) coupled to said input (Robertson fig. 1: inputs into top encoder is same as third and fourth inputs of top signal mapper) for producing coded bits from said uncoded bits (Robertson fig. 1: output of top encoder); an interleaver coupled to said input (Robertson fig. 1: left two inputs of the interleaver are coupled to said input) for producing from said uncoded bits an interleaved version of said uncoded bits (Robertson fig. 1: left two outputs of the interleaver); a second coder (Robertson fig. 1: bottom encoder including adders, delays, etc.) coupled to said interleaver (Robertson fig. 1: bottom two inputs of bottom signal mapper are the same as the inputs into the bottom encoder which is from the interleaver) for producing an interleaved version of said coded bits from the interleaved version of said uncoded bits (Robertson fig. 1: bottom input into bottom signal mapper is coded and interleaved, and its input is from the bottom encoder which is after the interleaver); a first mapper coupled to said first coder (Robertson fig. 1: top signal mapper's bottom input is coupled to the top encoder's output) for applying a first coded bits-to-signal mapping to said coded bits to produce a first output signal (Robertson fig. 1: output of top signal mapper); and a second mapper coupled to said second coder (Robertson fig. 1: bottom signal mapper's bottom input is coupled to the bottom encoder's output) for applying a second coded bits-to-signal mapping to the interleaved version of said coded bits to produce a second output signal (Robertson fig. 1: output of bottom signal mapper), wherein said second

coded bits-to-signal mapping differs from said first coded bits-to-signal mapping (Robertson fig. 1: top and bottom mappers are different at least because of different inputs; also, the outputs of the mappers are different and thus the mapping is different even though the type of mapper is the same).

~~14.~~ If it is not sufficient that Robertson shows different mappings, then Ko teaches different mappings in fig. 5 with mapper 23 and mapper 24 being different. Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to arrive at different mappings as recited by the instant claims, because the combined teaching of Robertson with Ko suggest different mappings as recited by the instant claims. Furthermore, one of ordinary skill in the art, would have been motivated to combine the teachings of Robertson with Ko because Robertson suggests separate signal mappers (something broad) in general and Ko suggests the beneficial use of separate signal mappers being different such as changing the code length (i.e. changing constellation size which would change number of bits per symbol) for transmission according to conditions and also to accommodate the memory size (Ko col. 1 lines 10-15) in the analogous art of signal mapping. Also, the choice of the type of mapper is a matter of design choice.

15. As per claims 19, 22, 23, see prior action for details.

16. As per claim 34: A method of performing parallel concatenated trellis-coded modulation, comprising: receiving uncoded bits from a communication application (Robertson fig. 1: third and fourth inputs of top signal mapper); encoding said uncoded bits to produce coded bits (Robertson fig. 1: output of top encoder); interleaving said uncoded bits to produce an interleaved version of said uncoded bits (Robertson fig. 1: left two outputs of the interleaver);

encoding the interleaved version of said uncoded bits to produce an interleaved version of said coded bits (Robertson fig. 1: bottom encoder which is after the interleaver); applying a first coded bits-to-signal mapping to said coded bits (Robertson fig. 1: top signal mapper's bottom input is coupled to the top encoder's output) to produce a first output signal (Robertson fig. 1: output of top signal mapper); and applying a second coded bits-to-signal mapping to the interleaved version of said coded bits (Robertson fig. 1: bottom signal mapper's bottom input is coupled to the bottom encoder's output) to produce a second output signal (Robertson fig. 1: output of bottom signal mapper), wherein said second coded bits-to-signal mapping differs from said first coded bits-to-signal mapping (Robertson fig. 1: top and bottom mappers are different at least because of different inputs; also, the outputs of the mappers are different and thus the mapping is different even though the type of mapper is the same).

17. If it is not sufficient that Robertson shows different mappings, then Ko teaches different mappings in fig. 5 with mapper 23 and mapper 24 being different. Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to arrive at different mappings as recited by the instant claims, because the combined teaching of Robertson with Ko suggest different mappings as recited by the instant claims. Furthermore, one of ordinary skill in the art, would have been motivated to combine the teachings of Robertson with Ko because Robertson suggests separate signal mappers (something broad) in general and Ko suggests the beneficial use of separate signal mappers being different such as changing the code length (i.e. changing constellation size which would change number of bits per symbol) for transmission according to conditions and also to accommodate the memory size (Ko col. 1 lines 10-15) in the

analogous art of signal mapping. Also, the choice of the type of mapper is a matter of design choice.

18. As per claim 37, see prior action for details.

19. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Robertson IEEE Feb. 1998 vol. 16 no. 2 pages 206-218 in view Ko as applied to claim 16 above, and further in view of Paik USPN 5,233,629. Here is how the reference teaches the claims:

20. As per claim 24: The apparatus of Claim 16, wherein said first mapper and said second mapper each implement one of 4-PAM mapping and 6-PAM mapping. Robertson teaches QAM, PSK but does not teach 4-PAM or 6-PAM. Paik teaches PAM (Paik col. 1 lines 22-42). Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to arrive at the 4-PAM or 6-PAM as recited by the instant claims, because the combined teaching of Robertson with Paik suggest mappers with mappings of 4-PAM and 6-PAM as recited by the instant claims. Furthermore, one of ordinary skill in the art, would have been motivated to combine the teachings of Robertson with Paik because Robertson suggests various mappings such as QAM and PSK (something broad) in general and Paik suggests the beneficial use of 16 bit QAM which has 4 levels or PAM mapping in general which include 4-PAM and 6-PAM (such as QAM being a form of PAM and hence if QAM is used, it means PAM is used since QAM is in the same family as PAM) in the analogous art of mapping.

21. Claims 1-3, 6-7, 8, 25, 26, 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Robertson IEEE Feb. 1998 vol. 16 no. 2 pages 206-218 in view of Wei USPN 6,473,878 and Ko USPN 5,703,580. Here is how the reference teaches the claims:

22. As per claim 1: A communication transmission apparatus, comprising: a first input for receiving coded bits (Robertson fig. 1: bottom input into top signal mapper receiving m~ coded bits); a second input for receiving an interleaved version of said coded bits (Robertson fig. 1: bottom input into bottom signal mapper receiving m~ interleaved coded bits; Robertson does not teach interleaved version of said coded bits but it would be obvious for Robertson to teach this as explained below); a first mapper coupled to said first input for applying a first coded bits-to-signal mapping to said coded bits to produce a first output signal (Robertson fig. 1: top signal mapper); a second mapper coupled to said second input for applying a second coded bits-to-signal mapping to the interleaved version of said coded bits to produce a second output signal (Robertson fig. 1: bottom signal mapper), wherein said second coded bits-to-signal mapping differs from said first coded bits-to-signal mapping (Robertson fig. 1: top and bottom signal mappers are separate and have different types of inputs and thus differ from each other since the top signal mapper's input are not interleaved and the bottom signal mapper's inputs are interleaved. But even if this is not enough to make the mappings different, it would be obvious to make them different as explained below.); and a communication channel interface coupled to said mappers for interfacing said output signals to a communication channel (Robertson fig. 1: output of signal mappers).

23. Robertson does not teach interleaved version of the coded bits. Wei teaches interleaved version of the coded bits (Wei fig. 108 is interleaving the coded bits from 106 and 107). Thus, it

would have been obvious, to one of ordinary skill in the art, at time the invention was made, to arrive at the interleaved version of the coded bits as indicated by the instant claims, because the combined teaching of Robertson with Wei suggest a transmitter which has an interleaved version of the coded bits as recited by the instant claims. Furthermore, one of ordinary skill in the art, would have been motivated to combine the teachings of Robertson with Wei because Robertson suggests data entering the interleaver and then being encoded (something broad) in general and Wei suggests the beneficial use of encoded data entering the interleaver and then being encoded (such as achieving increased bit rate for a given level of error rate performance by using turbo codes whose concept is to encode input data and combine with an interleaver (Wei col. 1 lines 14-20)) in the analogous art of trellis coded modulation.

24. With respect to the limitation of said second coded bits-to-signal mapping differs from said first coded bits-to-signal mapping, Robertson teaches in fig. 1 that the top and bottom signal mappers are separate and have different types of inputs and thus differ from each other since the top signal mapper's input are not interleaved and the bottom signal mapper's inputs are interleaved. Also, the outputs of the mappers are different and thus the mapping is different even though the type of mapper is the same. But even if this is not enough to make the mappings different, then Ko teaches different mappings in fig. 5 with mapper 23 and mapper 24 being different. Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to arrive at different mappings as recited by the instant claims, because the combined teaching of Robertson with Ko suggest different mappings as recited by the instant claims. Furthermore, one of ordinary skill in the art, would have been motivated to combine the teachings of Robertson with Ko because Robertson suggests separate signal mappers (something

broad) in general and Ko suggests the beneficial use of separate signal mappers being different such as changing the code length (i.e. changing constellation size which would change number of bits per symbol) for transmission according to conditions and also to accommodate the memory size (Ko col. 1 lines 10-15) in the analogous art of signal mapping. Also, the choice of the type of mapper is a matter of design choice.

25. As per claim 2: The apparatus of Claim 1, wherein said communication channel interface is a wireless communication channel interface (Wei col. 1 line 13).

~~26.~~ As per claim 3: The apparatus of Claim 1, provided as one of a wireless telephone, a laptop computer and a personal digital assistant (these items are part of the teaching of Wei with wireless and other digital communication system provided in col. 1 lines 13-14:).

27. As per claim 6: The apparatus of Claim 1, wherein said first mapping is set partition mapping (Robertson page 208 first column last paragraph: encoder ...set partitioning).

28. As per claim 7: The apparatus of Claim 1, wherein said first mapper and said second mapper each implement one of QPSK mapping (Robertson page 210 second column, 7$^{th}$ line from the bottom: QPSK; top right of fig. 3: only elements 0, 2, 4 and 6 comprise QPSK with the mapper on the left) and 8PSK mapping (Robertson page 208 first column last paragraph: encoder...8-PSK signaling...set partitioning).

29. As per claim 8: The apparatus of Claim 1, wherein said communication channel interface includes a combiner coupled to said first and second mappers for combining said first and second output signals to produce a combined output signal for interfacing to the communication channel (Ko fig. 8: outputs from the mappers are combined in 140 by converting from parallel to serial data.).

30. Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to arrive at the combiner as recited by the instant claims, because the combined teaching of Robertson in view of Wei with Ko suggest a communication channel interface including a combiner coupled to the mappers as indicated by the instant claims. Furthermore, one of ordinary skill in the art, would have been motivated to combine the teachings of Robertson in view of Wei with Ko because Robertson in view of Wei suggests having two outputs out of the two mappers (something broad) in general and Ko suggests the beneficial use of combining the two outputs out of the two mappers (such as converting from parallel outputs to a serial output which would save resources by not having multiple elements receiving and only one element receiving) in the analogous art of encoding data.

31. As per claim 25: A communication transmission method, comprising: receiving coded bits (Robertson fig. 1: top signal mapper's bottom input receiving coded bits) and an interleaved version of said coded bits (Robertson fig. 1: bottom signal mapper's bottom input receiving interleaved version of coded bits) (Robertson does not teach interleaved version of said coded bits but it would be obvious as explained below); applying a first coded bits-to-signal mapping to said coded bits to produce a first output signal (Robertson fig. 1: applying top signal mapper to produce output of the top signal mapper), applying a second coded bits-to-signal mapping to the interleaved version of said coded bits to produce a second output signal (Robertson fig. 1: applying bottom signal mapper to produce output of the bottom signal mapper), wherein said second coded bits-to-signal mapping differs from said first coded bits-to-signal mapping (Robertson fig. 1: top and bottom signal mappers are separate and have different types of inputs and thus differ from each other since the top signal mapper's input are not interleaved and the

bottom signal mapper's inputs are interleaved. But even if this is not enough to make the mappings different, it would be obvious to make them different as explained below.), and interfacing said output signals to a communication channel (Robertson title of IEEE journal: communications).

32. Robertson does not teach interleaved version of the coded bits. Wei teaches interleaved version of the coded bits (Wei fig. 108 is interleaving the coded bits from 106 and 107). Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to arrive at the interleaved version of the coded bits as indicated by the instant claims, because the combined teaching of Robertson with Wei suggest a transmitter which has an interleaved version of the coded bits as recited by the instant claims. Furthermore, one of ordinary skill in the art, would have been motivated to combine the teachings of Robertson with Wei because Robertson suggests data entering the interleaver and then being encoded (something broad) in general and Wei suggests the beneficial use of encoded data entering the interleaver and then being encoded (such as achieving increased bit rate for a given level of error rate performance by using turbo codes whose concept is to encode input data and combine with an interleaver (Wei col. 1 lines 14-20)) in the analogous art of trellis coded modulation.

33. With respect to the limitation of said second coded bits-to-signal mapping differs from said first coded bits-to-signal mapping, Robertson teaches in fig. 1 that the top and bottom signal mappers are separate and have different types of inputs and thus differ from each other since the top signal mapper's input are not interleaved and the bottom signal mapper's inputs are interleaved. Also, the outputs of the mappers are different and thus the mapping is different even though the type of mapper is the same. But even if this is not enough to make the mappings

different, then Ko teaches different mappings in fig. 5 with mapper 23 and mapper 24 being different. Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to arrive at different mappings as recited by the instant claims, because the combined teaching of Robertson with Ko suggest different mappings as recited by the instant claims. Furthermore, one of ordinary skill in the art, would have been motivated to combine the teachings of Robertson with Ko because Robertson suggests separate signal mappers (something broad) in general and Ko suggests the beneficial use of separate signal mappers being different such as changing the code length (i.e. changing constellation size which would change number of bits per symbol) for transmission according to conditions and also to accommodate the memory size (Ko col. 1 lines 10-15) in the analogous art of signal mapping. Also, the choice of the type of mapper is a matter of design choice.

34. As per claim 26: The method of Claim 25, wherein said interfacing step includes interfacing said output signals to a wireless communication channel (Wei col. 1 line 13).

35. As per claim 33: The method of Claim 25, wherein said interfacing step includes combining said first and second output signals to produce a combined output signal for interfacing to the communication channel (Ko fig. 8: outputs from the mappers are combined in 140 by converting from parallel to serial data.).

36. Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to arrive at the combiner as recited by the instant claims, because the combined teaching of Robertson in view of Wei with Ko suggest a communication channel interface including a combiner coupled to the mappers as indicated by the instant claims. Furthermore, one of ordinary skill in the art, would have been motivated to combine the teachings of

Robertson in view of Wei with Ko because Robertson in view of Wei suggests having two outputs out of the two mappers (something broad) in general and Ko suggests the beneficial use of combining the two outputs out of the two mappers (such as converting from parallel outputs to a serial output which would save resources by not having multiple elements receiving and only one element receiving) in the analogous art of encoding data.

37. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Robertson IEEE Feb. 1998 vol. 16 no. 2 pages 206-218 in view of Wei USPN 6,473,878 and Ko USPN 5,703,580 and further in view of Paik USPN 5,233,629. Here is how the reference teaches the claims:

38. As per claim 9: The apparatus of claim 1 wherein said first mapper and said second mapper each implement one of 4-PAM mapping and 6-PAM mapping (not in Robertson in view of Wei and Ko but would be obvious as explained below)

39. Robertson teaches QAM, PSK but does not teach 4-PAM or 6-PAM. Paik teaches PAM (Paik col. 1 lines 22-42).

40. Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to arrive at the 4-PAM or 6-PAM as recited by the instant claims, because the combined teaching of Robertson in view of Wei and Ko with Paik suggest mappers with mappings of 4-PAM and 6-PAM as recited by the instant claims. Furthermore, one of ordinary skill in the art, would have been motivated to combine the teachings of Robertson in view of Wei and Ko with Paik because Robertson in view of Wei and Ko suggests various mappings such as QAM and PSK (something broad) in general and Paik suggests the beneficial use of 16 bit QAM which has 4 levels of PAM mapping in general which include 4-PAM and 6-PAM (such as QAM

being a form of PAM and hence if QAM is used, it means PAM is used since QAM is in the same family as PAM) in the analogous art of mapping. Also, one would want to go to a different level of PAM such as 4PAM and 6PAM as tradeoffs over such parameters as bandwidth efficiency (Wei col. 1 line 35, col. 2 line 13), latency (Wei col. 1 line 43, col. 2 line 18), error rate (Wei col. 2 line 12) and coding gain (Wei col. 2 line 12).

***Allowable Subject Matter***

41. Claims 4, 5, 10-15, 17-18, 20, 21, 27-32, 35, 36 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Pankaj Kumar whose telephone number is (571) 272-3011. The examiner can normally be reached on Mon, Tues, Thurs and Fri after 8AM to after 6:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad H. Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Pankaj Kumar
Patent Examiner
Art Unit 2631

PK